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March 28, 1985

PGandE File No.: 405.071
PGandE Letter No.: 85000654
P&ES Letter No.: 69-19

Mr. Kenneth R. Jones
Executive Officer
California Regional Water Quality
Control Board, Central Coast Region
1102-A Laurel Lane
San Luis Obispo, CA 93401

Dear Mr. Jones:

Diablo Canyon Power Plant NPDES Permit No. CA0003751,
Amended Order No. 82-24, Annual Progress Reports

In accordance with Provisions D.6 and D.7 of the Diablo Canyon Power Plant (DCPP) National Pollution Discharge Elimination System (NPDES) permit, and reporting requirement six of the Monitoring and Reporting Program, Pacific Gas and Electric Company (PGandE) is providing the following information and attachments.

The annual report concerning the alternative demusseling program and heat treatment reduction as described in Provision D.6 is attached (Attachment 1). The report describes the study, presents a summary of progress attained in 1984, and forecasts the activities planned for 1985.

The 1984 Thermal Effects Monitoring Program (TEMP) annual progress report as described in Provision D.7(a) is also attached.

The 316(b) studies required by Provision D.7(b) were not initiated until February, 1985, and the results of the 1985 impingement sampling, entrainment special studies, and early entrainment sampling will be reported in the 1985 316(b) progress report.

If you have any questions concerning the information provided, please feel free to contact Mr. Robert Lorenz at (415) 972-4841 or Mr. John Warrick at (805) 595-7373.

Sincerely,

JC Carroll

JCC:dac

cc See Attached Distribution Sheet
Attachments

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Distribution Sheet

cc Marine Resources Region
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ATTACHMENT 1

HEAT TREATMENT OPTIMIZATION STUDIES AT THE DIABLO CANYON POWER PLANT 1984 PROGRESS REPORT

INTRODUCTION

The Diablo Canyon Power Plant Heat Treatment Optimization Study was initiated in early 1983. The purpose of this study is to develop a site specific heat treatment procedure which will maximize marine biofouling control and minimize potential environmental impacts. The study has been designed to satisfy requirements of Provision D.6 of the Diablo Canyon NPDES permit. Phase I of the study consisted of a laboratory determination of the thermal tolerance of major biofouling species. This work was completed in 1984. In Phase II, actual fouling communities are cultured in a sidestream of the power plant's cooling water flow to determine growth rates and periods of peak settlement. These fouling organisms are subjected to simulated heat treatment comprised of varying combinations of temperature and duration. Heat treatment simulations are conducted at a variety of intervals ranging from 4 weeks to 26 weeks. Physical model studies are being conducted in Phase III to determine the areal extent of the discharge plumes resulting from the heat treatment procedures simulated in Phase II. This information will be coupled with laboratory studies to predict the environmental consequences of heat treatment temperatures under various physical and environmental conditions. In addition, an engineering assessment of alternatives to heat treatment for the control of biofouling was added to Phase III during 1984. Results of all three study phases will be integrated to develop a site specific heat treatment program which maximizes the effectiveness of macrofouling control and minimizes environmental effects. The effectiveness of heat treatment

procedures will be monitored during Phase IV.

The sections which follow summarize the progress of the four study elements during 1984, and describe activities planned for 1985.

PHASE I: HEAT TOLERANCE STUDY

The goal of Phase I was to determine the thermal tolerance of individual macrofouling species. The bay mussel (Mytilus edulis) was chosen as the primary Phase I test organism because of its common occurrence as a fouling organism and its well documented tolerance to elevated temperatures. It was reasoned that any procedure which proved to be effective in controlling this species would also be effective against fouling species of lesser thermal tolerance.

Phase I experiments were completed in September of 1984. The results of these experiments were analyzed with probit analysis to develop the ED-95 curve shown in Figure 1. This figure represents those combinations of time and temperature which will result in 95 percent kill of mussels receiving the exposure. These results are based on a rise rate of 0.36 degrees F per minute and a cool down rate of 1 degree F per minute. The relationship between duration of exposure and target temperature established in Phase I was used to select heat treatment regimes for actual simulation in Phase II.

PHASE II: HEAT TREATMENT SIMULATION AND SETTLEMENT AND GROWTH STUDY

Phase II studies were begun in August 1984, concurrent with the completion of Phase I. For these studies, a sidestream biofouling monitor was constructed adjacent to the actual power plant cooling system. This monitor consists of a 50 foot long trough lined with removeable concrete plates (Figure 2). Seawater is diverted from the power plant's intake structure through the trough at a rate which duplicates the velocity and shear force found in the actual conduit.

MYTILUS EDULIS – Exposure Required for 95% Mortality

(2.5 hr ramp to target temp, 1 hr ramp down)

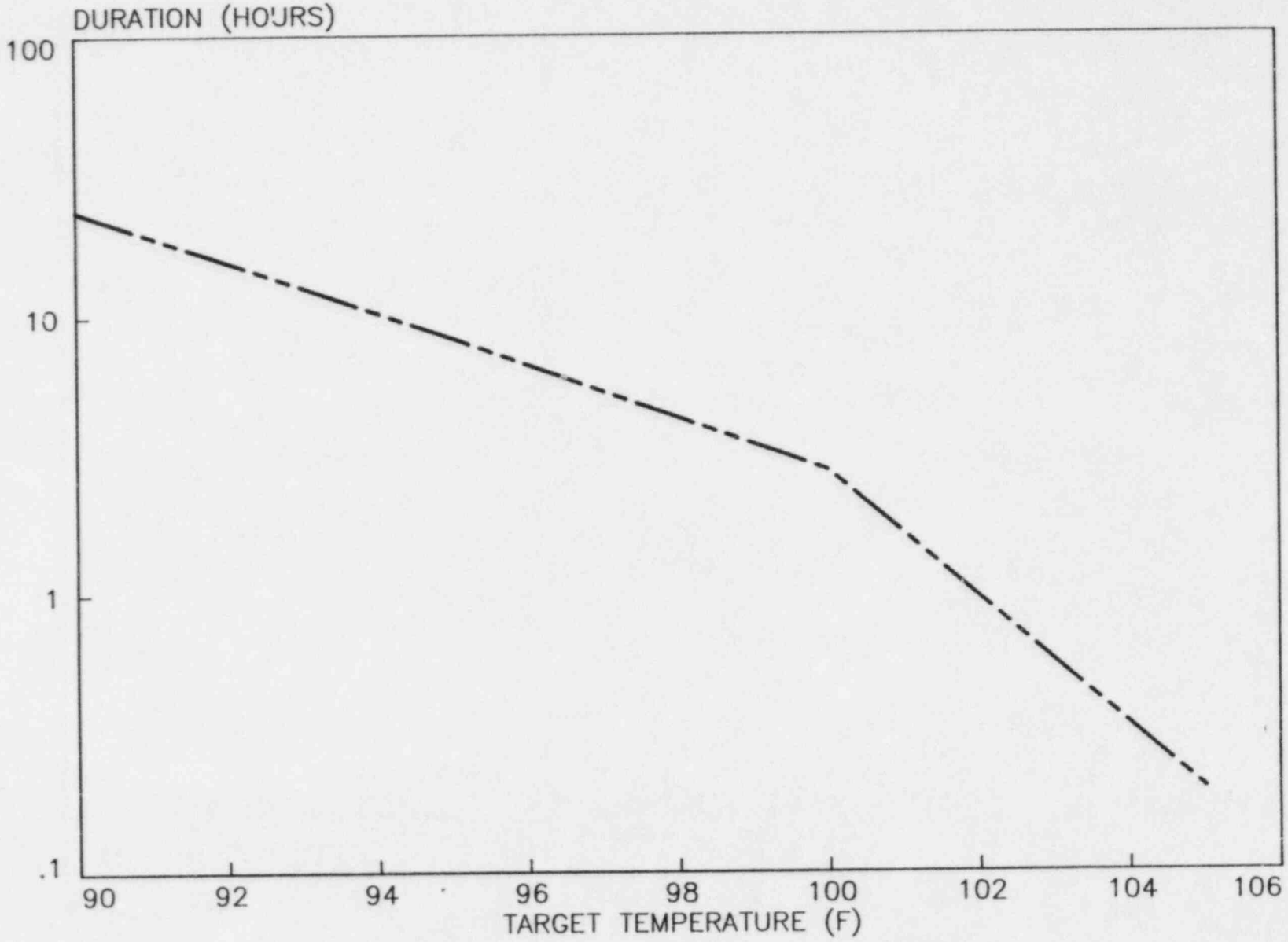

FIGURE 1

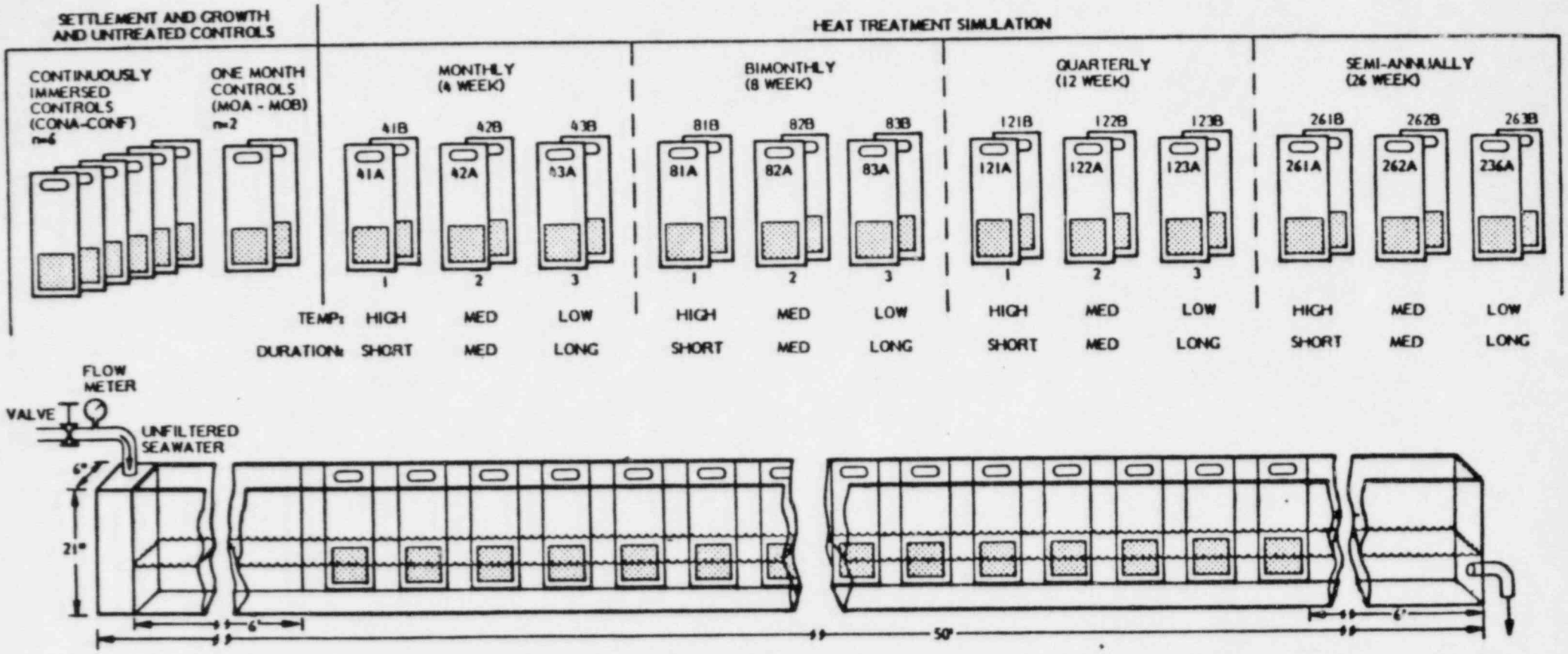

Figure 2

DIAGRAMMATIC REPRESENTATION OF PHASE II CONDUIT SIMULATION STUDY

The design of the monitor allows the concrete plates to be removed from the trough for analysis as required. Repeated observation of the plates provides a direct determination of the peak periods of recruitment for different macrofouling species and an assessment of their respective growth rates. In addition, fouled plates are removed and subjected to simulations of power plant heat treatment procedures in order to evaluate their effectiveness. Three different heat treatment regimes were selected for testing based on results of Phase I:

Regime	Target Temperature	Duration
HIGH-SHORT	105 degrees F	12 Minutes
MEDIUM-MEDIUM	102 degrees F	60 Minutes
LOW-LONG	99 degrees F	3.5 Hours

Each test plate receives a specified heat treatment at a predetermined frequency (Figure 2). A separate group of control plates are never subjected to heat treatment but are used to evaluate the species composition and growth rate of the fouling community.

Phase II studies will continue through 1985. Preliminary results suggest that all three heat treatment regimes are effective in controlling macrofouling. Continuation of these simulations through 1985 will determine the optimal frequency of heat treaments based on the observed growth rates of fouling species and the effectiveness of the fixed treatment frequencies.

PHASE III: ASSESSMENT OF ALTERNATIVES TO HEAT TREATMENT AND EVALUATION OF ENVIRONMENTAL EFFECTS OF HEAT TREATMENT

This phase of the optimization program was begun in 1984. It is designed to specifically address the order of Provision D.6 to "evaluate alternative demusseling programs" and to respond to the

order of the State Water Resources Control Board to expand the Provision D.6 studies to include environmental considerations.

The assessment of alternatives consists of an exhaustive evaluation of all other possible methods for the control of biofouling which might be utilized at Diablo Canyon. The rationale and approach are similar to those used in the Assessment of Alternatives to the Existing Cooling Water System, which was submitted to the Board in 1982. For the present assessment, alternative control methods have been classified into five categories. These consist of hydraulic, thermal, mechanical, chemical, and other methods. A thorough screening of alternatives will include technical feasibility, cost, and environmental characteristics. The assessment of alternatives will be completed during 1985.

The approach used to evaluate the potential environmental consequences of heat treatment requires three types of information: the distribution of benthic species in the area of the thermal discharge, the thermal tolerance of these species, and information regarding the behavior of the thermal plume under various physical environmental and power plant operating conditions. The majority of this information has previously been gathered during environmental studies at the site. Additional experiments on the thermal sensitivity of high intertidal species was begun in 1984 in order to thoroughly evaluate the response of different marine communities. Physical model studies initiated in 1984 will determine the characteristics of heat treatment discharge plumes at various combinations of tide, current direction and strength, power plant configuration, and heat treatment temperature. These results will be integrated to produce risk assessments for select receiving water

species. This work will be completed during 1985.

PHASE IV: HEAT TREATMENT EFFECTIVENESS MONITORING

Once a recommended optimal heat treatment program has been instituted, a monitoring study will commence in order to provide a real-time evaluation of effectiveness. This study will utilize the biofouling trough sidestream as a monitor. Ongoing evaluation of fouling plate communities will be coupled with periodic inspections of the power plant's cooling water system to evaluate the long term effectiveness of heat treatments. This phase is scheduled to begin in 1985.